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Chapter 13.

Aviation and Other Effects

Contents

Glossary

Term	Definition
Environmental Impact Assessment	Environmental Impact Assessment (EIA) is a means of carrying out, in a systematic way, an assessment of the likely significant environmental effects from a development.
Environmental Impact Assessment Regulations	The Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2017 (EIA Regulations)
Environmental Impact Assessment Report	A document reporting the findings of the EIA and produced in accordance with the EIA Regulations
Proposed Development	The South Kyle II Wind Farm development
Proposed Development Area	The area within the “Site boundary” as illustrated on Figure 1.1 which the Proposed Development will be located

List of Abbreviations

Abbreviation	Description
AIP	Aeronautical Information Publication
ANO	Air Navigation Order
AGA	Air-Ground-Air (communications)
ATC	Air Traffic Control
ATS	Airport’s Air Traffic Services
CAA	Civil Aviation Authority
CAP	Civil Aviation Publication
DIO	Defence Infrastructure Organisation
GPA	Glasgow Prestwick Airport
ICAO	International Civil Aviation Authority
IFP	Instrument Flight Procedure
MOD	Ministry of Defence
NATS	National Air Traffic Services
NERL	NATS (En-Route) PLC
PSR	Primary Surveillance Radar
RAF	Royal Air Force
SSR	Secondary Surveillance Radar
TOPA	Technical and Operational Assessment

13.1. Aviation

Introduction

13.1.1. Wind developments have the potential to cause a variety of effects upon aviation safeguarding and radar infrastructure by introducing new physical structures (turbines) into an area. Large structures can affect these in two ways:

- By presenting a collision risk for aircraft.
- The blocking and/or reflection of radio signals.

13.1.2. Aviation lighting schemes are required to enhance the visibility of obstacles and fixed structures that may impact the safeguarding of aviation activity.

13.1.3. This chapter describes the existing environment with respect to aviation (including radar), and the potential impacts to their operations as a result of construction and operation of the Proposed Development. Where required, the associated impact significance is provided, and the appropriate mitigation options are presented.

Legislation, Policy and Guidance

Aviation

13.1.4. Guidance and policy with respect to Aviation are dictated primarily by the Civil Aviation Authority (CAA) and Civil Aviation Publications (CAP).

13.1.5. There is also policy/guidance provided by National Air Traffic Service (NATS) and the Ministry of Defence (MOD).

13.1.6. The impact of wind turbines upon the infrastructure required to operate an air traffic service, such as NATS Air-Ground-Air (AGA) and En-route Navigation Aids, is complex and dependent on a wide range of factors. NATS provide self-assessment maps via an online resource for geographical reference, as well as a Technical and Operational Assessment (TOPA).

13.1.7. The MOD provide maps for geographical reference for military low flying zones.

13.1.8. Specific document guidance relevant to the Proposed Development include:

- CAA (2024), CAP 764: Policy and Guidelines on Wind Turbines (Draft)
- CAA (2022), CAP 168: Licensing of Aerodromes – Edition 12[1].
- CAA (2019), CAP 670: Air Traffic Services Safety Requirements – Edition 3[2].
- CAA (2020), CAP 738: Safeguarding of Aerodromes – Edition 3[3].
- CAA (2016), CAP 764: CAA Policy and Guidelines on Wind Turbines – Edition 6[4].
- CAA (2018), CAP 777: Air Traffic Control (ATC) Surveillance Minimum Altitude Charts in UK Airspace Policy and Design Criteria[5].
- International Civil Aviation Authority (ICAO) Procedures for Air Navigation Services, Aircraft Operations, Volume II Construction of Visual and Instrument Flight Procedures, Fifth Edition[6].
- NATS Aeronautical Information Publication (AIP) (digital resource, regularly updated).

[1] CAP 168 Licensing of Aerodromes (caa.co.uk) [Accessed 08/08/2024]

[2] 17362 (caa.co.uk) [Accessed 08/08/2024]

[3] Safeguarding of Aerodromes (caa.co.uk) [Accessed 08/08/2024]

[4] 14561 (caa.co.uk) [Accessed 08/08/2024]

[5] 20568 (caa.co.uk) [Accessed 08/08/2024]

[6] Aircraft Operations. Volume II (spilve.lv) [Accessed 08/08/2024]

- Air Navigation Order (ANO), 2016[7] – government legislation.

Radar

13.1.9. Consultation criteria for civil aviation stakeholders is defined in Chapter 4 of CAP 764 Policy and Guidelines on Wind Turbines (CAP 764). A revision to CAP764 was consulted on by the CAA and the consultation closed May 2024. The revision makes it clear that "*both wind energy and aviation are important to UK national interests, and both industries have legitimate interests that must be balanced carefully. Therefore, for both industries, there is the need for establishing 'win-win' outcomes; suitable mitigation solutions are developed and applied only where absolutely necessary*". At paragraph 1.18b it also states that: "*It is not automatically the case that a wind turbine development will result in a degradation to [an ANSP's] service. The service provider must first assess whether the planned development will technically impact upon the CNS systems used. Where it is assessed that there will be a technical impact, the service provider must then assess whether this has any operational significance*

13.1.10. CAP 764 acknowledges that there are many factors that affect safeguarding criteria and stresses that the distances shown in Table 13.1 for guidance only:

Table 13.1: Recommended distances for consultation

Stakeholder	Distance
Aerodrome with a surveillance radar	Within 30 km
Licensed aerodrome where the turbines would lie within airspace coincidental with any published Instrument Flight Procedure (IFP)	N/A
Non-radar licensed aerodrome with a runway greater than 1,100 m	Within 17 km
Non-radar licensed aerodrome with a runway less than 1,100 m	Within 5 km
Unlicensed aerodromes with runways greater than 800 m	Within 4 km
Unlicensed aerodromes with runways less than 800 m	Within 3 km
Gliding sites	Within 10 km

13.1.11. Other aviation activity such as parachute sites and microlight sites within 3 km – in such instances developers are referred to appropriate organisations.

13.1.12. Other document guidance relevant to the Proposed Development include:

- Eurocontrol (2014), Eurocontrol Guidelines: How to Assess the Potential Impact of Wind Turbines Surveillance Sensors – Edition 1.2.

13.1.13. The Eurocontrol recommended ranges for assessing Primary Surveillance Radar (PSR) are outlined in Table 13.2:

Table 13.2: Recommended distances for assessing PSR

Zone/Distance	Required Assessment
Zone 1: Between 0 m and 500 m	Safeguarding assessment
Zone 2: Between 500 m and 15 km and in radar line of sight	Detailed assessment
Zone 3: Greater than 15 km but within maximum instrumented range and in radar line of sight	Simple assessment
Zone 4: Anywhere within maximum instrumented range but not in radar line of sight or outside the maximum instrumented range	No assessment

Source: Eurocontrol, 2014

13.1.14. The Eurocontrol recommended ranges for assessing Secondary Surveillance Radar (SSR) is outlined in Table 13.3:

Table 13.3: Recommended distances for assessing SSR

Zone/Distance	Required Assessment
Zone 1: Between 0 and 500 m	Safeguarding assessment
Zone 2: Between 500 m and 16 km but within maximum instrumented range and in radar line of sight	Detailed assessment
Zone 4: Anywhere within maximum instrumented range but not in radar line of sight or outside the maximum instrumented range	No assessment

Source: Eurocontrol, 2014

13.1.15. It is industry best practice within the UK to assess radar beyond the ranges referred to as per the guidance documents.

13.1.16. Military radar are often safeguarded on a line-of-sight basis regardless of the distance between the radar and obstruction.

13.1.17. Many civil aviation radar are safeguarded beyond 30 km in practice.

Desk Based Research and Data Sources

13.1.18. The relevant aviation and radar infrastructure was identified through a national database maintained by Pager Power, based on information provided in aviation charts and maps, including previous consultation with stakeholders.

Baseline

13.1.19. The closest licensed aerodrome with an existing surveillance radar is Glasgow Prestwick Airport approximately 24 km northwest of the Proposed Development. There are existing wind farms in the immediate surrounding area of the Proposed Development that Glasgow Prestwick Airport (GPA) have concerns with in respect of potential impacts on aviation safeguarding.

13.1.20. Unlicensed aerodromes with runways less than 800 m are all greater than 3 km away from the Proposed Development.

13.1.21. The Proposed Development is outside the safeguarded zones for NATS Air-Ground-Air (AGA) Communication Sites and En-route Navigation Aids.

13.1.22. There are no known military radar within 100 km of the Proposed Development. The nearest military base is RAF Spadeadam approximately 116 km east of the Proposed Development.

[7] The Air Navigation Order 2016 (legislation.gov.uk) [Accessed 08/08/2024]

13.1.23. The Proposed Development is within a high-priority military low flying area.

Assessment of Potential Impacts

13.1.24. The significance criteria and presentation of the potential effects caused by the Proposed Development is presented in the following sections.

13.1.25. Each impact is assessed based on its magnitude and the sensitivity of the affected receptor.

13.1.26. The definitions of the magnitude of impact, sensitivity of receptor and significance of impact are defined by industry experience and best practice, and outlined in Tables 13.4, 13.5 and 13.6 respectively.

Table 13.4: Magnitude of Impact

Magnitude of Impact	Criteria
High	Total loss or substantial alteration to key features of the baseline conditions such that receptor attributes will be fundamentally changed.
Moderate	Loss or alteration to one or more key features of the baseline conditions such that receptor attributes will be materially changed.
Low	A minor shift away from baseline conditions. Change arising from the alteration will be discernible but not material. The underlying attributes of the baseline condition will be largely unchanged.
Negligible	Very little change from baseline conditions. Change barely distinguishable, approximating to a 'no change' situation.

Table 13.5: Sensitivity of Receptor

Significance of Receptor	Criteria
High	The receptor has little ability to absorb change without fundamentally altering its present character or is of international or national importance.
Medium	The receptor has moderate capacity to absorb change without significantly altering its present character or is of high importance.
Low	The receptor is tolerant of change without detriment to its character or is of low or local importance.

Table 13.6: Significance of Impact Matrix

	Sensitivity		
Impact Significance	**High**	**Medium**	**Low**
High	Major Adverse	Major Adverse	Moderate Adverse
Moderate	Major Adverse	Moderate Adverse	Moderate Adverse
Low	Minor Adverse	Minor Adverse	Minor Adverse
Negligible	Negligible	Negligible	Negligible

Aviation Safeguarding and Radar Infrastructure

13.1.27. The impact upon aviation safeguarding and radar infrastructure is dependent on numerous factors including the number of wind turbines, wind turbine dimensions and wind turbine locations relative to the relevant infrastructure.

13.1.28. A 'Moderate' or higher magnitude of impact to aviation infrastructure would be considered significant. This is where a technical or operational impact would occur, e.g clutter on a radar screen caused by wind turbines.

13.1.29. With regard to receptor sensitivity, any location where aviation infrastructure and/or operations were significantly affected beyond baseline conditions, a significant effect would occur. However, aviation infrastructure varies significantly and therefore sensitivity can range from 'Low' to 'High'.

13.1.30. Overall, the level of effect which would be considered 'significant' with respect to EIA if the resultant significance of effect is 'Moderate Adverse' or greater.

13.1.31. The Proposed Development is understood to impact the NATS Lowther Hill radar, following conclusions of the TOPA which was undertaken by NATS En-Route PLC (NERL). The TOPA concluded that the terrain screening available would not adequately attenuate the signal, and therefore the Proposed Development is likely to cause false primary plots to be generated and as such a reduction in the RADAR's probability of detection, for real aircraft, is also anticipated. The Magnitude of Impact is Moderate, and the Sensitivity of the receptor is Medium. Therefore, the overall Significance of Impact is Moderate Adverse.

13.1.32. Following discussions with NATS we have agreed that a technical solution is required to mitigate the cluster effects caused by the wind turbines at the Proposed Development on NERL's Primary Surveillance Radar system at Lowther Hill. It has been agreed with NATS that there may be a potential solution and it may provide suitable mitigation and as such they will not object to the Proposed Development.

13.1.33. The Proposed Development is understood to be within the operational airspace of GPA, and therefore has potential to impact the surveillance radars and the IFP. For the surveillance radar, the Magnitude of Impact is Moderate, and the Sensitivity of the receptor is Medium. Therefore, the overall Significance of Impact is Moderate Adverse.

13.1.34. For the IFP, the Magnitude of Impact is Negligible, as the turbines have been positioned at heights above ground level, taking into account the proposed tip heights of the turbines to meet the safeguarding requirements for IFP at Prestwick Airport. The Sensitivity of the receptor is High. Therefore, the overall Significance of Impact is Negligible.

13.1.35. Vattenfall has been working with GPA to agree the necessary mitigation to avoid adverse operational impacts on the Airport's Air Traffic Services (ATS). It is acknowledged that any relevant turbine forming part of the Proposed Development will be subject to an appropriate mitigation scheme to mitigate the adverse impact of the Proposed Development on its Primary Surveillance Radar (PSR) and ATS, that can be delivered within a reasonable timeframe. In light of the progress of this work, Vattenfall and GPA are in discussions regarding an appropriate

mitigation agreement which will allow GPA to not object, or withdraw any holding objection, to the Proposed Development subject to the imposition of suspensive planning conditions being attached to any planning consent granted. The wording and terms of these planning conditions to be agreed. The Proposed Development is within a high-priority military low flying area. The Magnitude of Impact is Moderate, and the Sensitivity of the receptor is High. Therefore, the overall Significance of Impact is Major Adverse. Defence Infrastructure Organisation (DIO) stated in their response to our scoping opinion that the MOD had concerns about our initial proposals for a 17-turbine development with tip heights of 220m in height above ground level.

13.1.36. To address these concerns the MOD requested that turbines be fitted with MOD accredited aviation safety lighting in accordance with the requirements of the Air Navigation Order 2016. The Proposed Development is now a reduced scheme of 11 turbines and tip heights have been reduced to 200m in height from ground level. Furthermore, the turbines of the Proposed Development will be turbines be fitted with MOD accredited aviation safety lighting in accordance with the requirements of the Air Navigation Order 2016.

Mitigation

13.1.37. Aviation lighting is an inherent mitigation requirement due to the turbine measuring greater than 150 m above ground level. This is a legal requirement under Article 222 of the ANO 2016 unless the CAA dictate otherwise. The basic requirement is for medium intensity 'steady' red aviation lights, rated at 2,000 candela, to be fitted at nacelle level.

13.1.38. The following aviation lighting scheme has been agreed with the CAA:

- Medium intensity steady-red (2,000 candela) are to be fitted on the nacelles of turbines T01, T04, T05, T09 and T10.
- A second 2,000 candela light on the nacelles of the above turbines to act as alternate in the event of a failure of the main light (both lights should not be lit at the same time).
- Lights are capable of being dimmed to 10% of peak intensity when the lowest visibility (as measured at suitable points around the wind farm by visibility measuring devices) exceeds 5 km.
- A scheme of infra-red lighting to be agreed with the MOD to account for operators who carry night vision device capability (dimming permission is applicable only to visible lights, not infra-red lighting).

13.1.39. The final lighting scheme has been agreed by the CAA.

13.1.40. Mitigation for the impact upon the radar infrastructure at GPA is under discussion with that airport facility.

13.1.41. Mitigation for the impact upon the Lowther Hill AGA radar has been agreed with NATS.

Residual Impacts

13.1.42. No residual impacts are predicted for aviation safeguarding and radar infrastructure.

Cumulative Impacts

13.1.43. No cumulative impacts with existing wind farms are anticipated. All possible impacts identified originate from the Proposed Development, whereby cumulative impacts are not anticipated.

Statement of Significance

13.1.44. The overall Significance of Impact is Major Adverse for impacts associated with aviation safeguarding pertaining to NATS, GPA/CAA and MOD.

13.1.45. Mitigation in the form of an aviation lighting scheme is required for impacts upon aviation safeguarding concerning both the CAA and MOD. A lighting scheme has been agreed with the CAA and will be finalised with the MOD.

Statement of Competence

13.1.46. Pager Power was established in 1997 and have worked on projects in 58 countries. The company comprises a team of experts to provide technical expertise and guidance on a range of consenting issues for large and small developments. Initially, the company focus was on modelling the impact of wind turbines on radar systems. Over the years, the company has expanded into numerous fields including:

- Renewable energy projects.
- Building developments.
- Aviation and telecommunication systems.

SUMMARY

13.1.47. The Proposed Development will introduce a new tall structure in the vicinity of operational airspace for Glasgow Prestwick Airport and military low flying. Surveillance radar at Glasgow Prestwick Airport is approximately 24 km northwest of the Proposed Development.

13.1.48. Mitigation in the form of an aviation lighting scheme is required to mitigate impacts upon aviation safeguarding for the CAA and MOD. A lighting scheme has been approved by the CAA and is also a scheme that is considered acceptable to the MOD

13.1.49. Potential mitigation for the impact upon the radar infrastructure at GPA has been agreed with that airport facility.

13.1.50. Potential mitigation for the impact upon the Lowther Hill AGA radar is considered to be achievable and capable of being delivered as agreed with NATS.

13.2. SAFETY

13.2.1. Wind turbines have a proven track record for good safety. A small number of wind turbines have been known to lose parts of the rotor assembly through accidental damage, due to lightning or mechanical failure, however, such incidents occur infrequently.

13.2.2. The safe operation of wind turbines is ensured through a combination of design, quality control and manufacturing to high safety standards.

13.2.3. The Applicant will ensure that the selected wind turbine model will have certification from an internationally recognised authority and have a proven track record of safe operation.

13.2.4. The wind turbines installed in the Proposed Development Area will comply with the British Standard BS EN 61400-1 'Wind turbines, Design Requirements[8].'

13.2.5. The primary safety system at the Proposed Development Area will include a computerised central control system housed within the control building. This system will continually monitor the operational status and safe working of key components for the wind turbines and will allow the operator to remotely monitor the wind turbines.

[8] BS EN 61400-1:2005+A1:2010 | 9 Jan 2006 | BSI Knowledge (bsigroup.com) [Accessed 08/08/2024]

Major Accidents and/or Incidents

13.2.6. Given the nature of the Proposed Development, and its remote location, the risk of a major accident or disaster is considered to be extremely low. The Principal Designer will ensure a Design Risk Assessment process is followed during the design phase to ensure designers fully assess risks and mitigate to a level deemed as low as reasonably practicable during the design stage as part of the requirements of the Construction (Design and Management) Regulations (2015)[9].

13.2.7. During the operational phase of the Proposed Development, routine maintenance inspections will be completed in order to ensure the safe and compliant operation of all built infrastructure.

Lightning Strike

13.2.8. A small number of wind turbines have been known to lose parts of the rotor assembly through damage caused by lightning, however, such incidents occur rarely.

13.2.9. Turbines are equipped with lightning conductors as mitigation to lightning strikes which could damage internal components.

Air Quality

13.2.10. The air quality of the site is expected to be good due to the rural location, with few pollution sources.

13.2.11. During the construction of the wind farm, the increased traffic flow on local roads and the on-site plant would generate exhaust emissions. However, given the short-term nature of the construction period and the limited area to be developed, effects on air quality are likely to be negligible.

13.2.12. During dry spells, construction activities have the potential to generate dust, which may adversely affect local air quality. Given the scale and nature of construction activities and given the distance between construction areas and the nearest residential properties, it is considered that dust from construction is unlikely to cause a nuisance or cause significant effect upon local air quality.

13.2.13. An operational wind farm produces no notable atmospheric emissions. The operation of the wind farm would therefore have no discernible adverse effects on local or national air quality.

13.2.14. Relevant mitigation measures for air quality, dust and pollution control will be captured within the site-specific Construction and Environmental Management Plan (CEMP).

Ice Throw

13.2.15. Icing in Scotland is likely to be a rare occurrence, with the Icing Map of Europe[10] (WECO, 2000) showing Scotland to be within a light icing area with an annual average of only 2-7 icing days per year.

13.2.16. Wind turbines are fitted with vibration sensors which can shut the wind turbines down should any imbalance that might be caused by icing be detected. Turbines are then restarted after any ice which has formed as melted away.

13.2.17. To further minimise the risk, the following mitigation measures will be taken:

- Service crews will be trained regarding the potential for ice throw;
- Ice risk conditions will be monitored by the wind farm operator; and
- Public notices will be displayed at access points to the Site, alerting members of the public and staff accessing the Site of the possible risk of ice throw under certain weather conditions.

13.3. Public Access

Core Paths & Public Rights of Way

13.3.1. There are no core paths within or that directly dissect the proposed development area as advised by East Ayrshire Council[11]. There are also no public rights of way that will be directly impacted by the Proposed Development.

13.3.2. Although members of the public have the right to roam land in Scotland under the Land Reform (Scotland) Act 2003 there will be restricted access during the construction phase for Health & Safety purposes. It is expected that the Proposed Development Area will be managed during the construction phase under the Construction (Design and Management) Regulations 2015.

13.3.3. The Applicant would provide funding for improvements to outdoor access through the community benefit fund associated with the Proposed Development, should the consent be granted.

SUMMARY

13.3.4. There are no direct adverse effects upon Core Paths or Public Rights of Way. Existing forestry paths and tracks would be appropriately managed during construction for health and safety purposes.

13.4. Telecommunication Networks

13.4.1. Telecommunications and broadcasting network operators were consulted during the scoping exercise. Openreach responded to confirm that the Proposed Development should not cause interference to BT's current and presently planned radio network. The Joint Radio Company Limited also responded to scoping indicating that links would not be affected. It is acknowledged that the turbine layout has changed since Scoping however it appears that these particular assets do not feature within the Proposed Development Area and therefore it is expected that these stakeholders will remain unaffected.

13.4.2. With the information available to the Applicant, the Proposed Development does not directly affect microwave fixed links and the potential effect on microwave fixed links is not significant. Pre-construction checks would be undertaken to ensure this still remains the case nearer the time of construction.

13.5. Shadow Flicker

13.5.1. Wind turbines are tall structures which can cast long shadows when the sun is low in the sky. Given a conjunction of certain meteorological conditions (clear skies, enough wind for the turbines to be rotating and a low angle of the sun in the sky), observers close to a wind farm could experience a phenomenon commonly known as "shadow flicker", where the rotating turbine blades pass between the sun and the observer creating an intermittent shadow. It is, however, part of the nature of long shadows that they pass any particular point relatively quickly and the effect, if present, lasts a short period of time, due to the movement of the sun across the sky. They are generally only observed in the period after dawn and before sunset as the sun is rising and setting.

[9] The Construction (Design and Management) Regulations 2015 (legislation.gov.uk) [Accessed 08/08/2024]

[10] Icing map of Europe 1. | Download Scientific Diagram (researchgate.net) [Accessed 08/08/2024]

[11] Rights of way, core paths and footpaths · East Ayrshire Council (east-ayrshire.gov.uk)

13.5.2. Natural Power Consultants Limited were commissioned by Vattenfall, to conduct a shadow flicker assessment of the Proposed Development South Kyle II Wind Farm.

13.5.3. This work is to determine the extent of the worst-case shadow flicker effects on nearby residential or commercial properties, henceforth called receptors. See Technical Appendix 13.1: Shadow Flicker Summary Report (Volume 3) for full details.

13.5.4. The likelihood and duration of the effect depends upon several variable factors:

- Location of the property relative to the turbine.
- Distance from turbine. The further an observer is from the turbine, the less pronounced the effect will be.
- Wind speed and direction. The wind speed at the turbine will need to be greater than the cut-in wind speed of the turbine (typically 3 m/s), and below the cut-out wind speed, in order for the blades to be rotating. Furthermore, the shape of the shadow will be determined by the position of the sun relative to the blades, which will be yawed to face the wind under normal turbine operation.
- Turbine height and rotor diameter.
- Time of year and day as this determines the height and angle (azimuth and zenith) of the sun in the sky.
- Weather conditions at the time – direct sunshine is required to create the flicker effect and therefore cloud cover reduces the risk of shadow flicker.

13.5.5. While all these factors impact the prevalence of shadow flicker effect occurring at a site, not all factors can be effectively modelled, and a number of assumptions need to be made as part of the modelling process.

13.5.6. When assessing the impact of shadow flicker at a site, two possible conditions can be considered:

- Worst-case – this determines the maximum number theoretical hours of shadow flicker that can occur, not accounting for the likelihood of direct sunshine occurring in the region, coinciding with periods where shadow flicker is possible. This is a geometric-based calculation, dependant on the location of the sun with respect to the turbine blade, and alignment with the receptor of interest. Outside of these periods, irrespective of the cloud cover and sunshine status, flicker cannot physically occur. The outcome of this process is the maximum number of hours (per annum) at which flicker could, in theory, occur.
- Real-case – this takes the worst-case scenario, and then adjusts the duration of the total potential flicker events by the likelihood that direct sunshine occurs in a region. This results in a more accurate representation of the number of hours per year, that a receptor location may experience shadow flicker. The turbines are still modelled as though they are always yawed perpendicularly to the line between the receptor and the sun, inducing maximum shadow effect. The real-case does not take into account wind direction and the influence on this to the shadows.

SUMMARY

13.5.7. The results for the worst-case and real-case shadow flicker assessment are detailed in Technical Appendix 13.1: Shadow Flicker Summary Report (Volume 3) for full details.

13.5.8. The results indicate that across affected receptors, the worst-case impact is between 18.0 and 59.4 hours per year. Three receptors of the total four receptors experience shadow flicker above the maximum allowed 30 minutes/day and 30 hours/year. However, when considering the real-case assessment, no receptors breach the maximum limits of shadow flicker. When assessing cumulative shadow flicker affects from neighbouring farms, Natural Power found that there were no increases in effect at any of the receptors considered in this analysis.

13.5.9. Potential effects upon residential visual amenity are also assessed in Volume 1, Chapter 5: LVIA.